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2882	

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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)
	10/812,211	LAWRENCE ET AL.
	Examiner	**Art Unit**
	Anastasia Midkiff	2882

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *29 March 2004*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-38* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-38* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *29 March 2004* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *29 March 2004*.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application (PTO-152)

6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 15, 16, 29 and 30 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claims 15, 16, 19, and 20 provide for an intended use of apparatus, but since the claims do not set forth any structure involved in said apparatus, nor any steps involved in the method for its use, it is unclear what apparatus and/or method applicant is intending to encompass. An object acted upon does not determine the structure of said apparatus, or the method for its use.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 35 and 37 are rejected under 35 U.S.C. 102(e) as being anticipated by U.S. Patent Application Publication to Kieffer et al. (PGPUB# 2004/0037392).

With respect to Claim 35, Kieffer et al. teach a method for generating x-rays, comprising rotating a target (16, and Paragraph 46) within an x-ray generation chamber (18), focusing a laser beam (14 and Paragraph 50, Lines 6-8) onto a focal point through which point said target rotates (Paragraph 51, Lines 3-5), indexing the target to raster the focal point so that each successive focal point focuses on a previously unexposed portion of said target (Paragraph 44 Lines 1-5, Paragraph 60, and Page 6, Column 2, Lines 11-29).

With respect to Claim 37, Kieffer et al. further teach said focal point rastered radially along the target (Paragraphs 46, 60, and Figures 5 and 6).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claim 38 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kieffer et al. as disclosed above, in view of U.S. Patent to Zhao et al. (USP# 6,937,689).

With respect to Claim 38, Kieffer et al. teach the elements of Claim 35 as disclosed above, but do not teach a method wherein said x-ray bulb is moved about a volume to be imaged.

Zhao et al. teach a method wherein x-ray sources (141, 412, 143) are moved about a volume (22) to be imaged (Column 3, Lines 27-32).

It would be obvious to one of ordinary skill in the art at the time of the invention to use the moving, multiple sources of Zhao, and the method for their use, in the system and method of Kieffer et al., to achieve a sampling lattice for computed tomography imaging of a volume, to reduce motion artifacts and improve signal-to-noise ratio of imaging, as taught by Zhao et al. (Column 3 Lines 41-67, and Column 2 Lines 1-31), and to reduce the number of scans (Column 4, Lines 29-34) which would minimize patient exposure to radiation.

Claims 1, 3-5, 7, 10, 11, 19, 22, and 36 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent Application Publication to Kieffer et al. (PGPUB# 2004/0037392) in view of U.S. Patent Application Publication to Tsuno et al. (PGPUB# 2004/0246610), and in further view of Radiology article by Tillman et al.

With respect to Claim 1, Kieffer et al. teach an x-ray generation chamber (18) with an envelope (See Figure 1) containing a target (16) wherein said target rotates about an axis (Figure 1 and Paragraph 46 Lines 1-3), such that said target is positioned at a focal point of a laser (14, and Paragraph 51 Lines 4-5), exposing a fresh target surface to said laser at each shot of laser onto said target (Paragraph 46, Lines 3-8).

Kieffer et al. do not teach said generation chamber to have at least a partially rounded surface so as to comprise a bulb envelope, or that said bulb envelope has a coating on its curved surface to form a focusing surface for said laser.

Tsuno et al. teach an optical device in the form of a curved mirror Figure 4(b), Item 102), wherein said curved surface has a thin metal film coating (Page 7, Column 2, Lines 15-19) which forms a mirrored focusing surface (Paragraph 82, Lines 3-5, and Paragraph 83, Lines 4-6) on an underlying curved substrate (Page 7, Column 1, Lines 51-52), said mirror for use with light of shorter wavelengths, including ultra-high frequency ranges (Paragraph 4).

It would be obvious to one of ordinary skill in the art at the time of the invention to use the curved, focusing surface of Tsuno et al. in the x-ray generating chamber of Kieffer et al., to shorten the distance that the laser must travel from focusing surface to target, helping to reduce loss of light due to distance traveled through air, as taught by Tsuno et al. (Paragraph 5, Lines 7-11), and to reduce the number of parts required for laser x-ray generation by removing the need for the parabolic mirror of Kieffer et al.

Tillman et al. teach a parabolic mirror surface disposed within the interior surface of an envelope of an x-ray generation apparatus, wherein said mirror surface focuses said laser onto target to produce x-rays (Figure 1).

It would be obvious to one of ordinary skill in the art at the time of the invention to use the placement of mirror surface of Tillman et al. in the x-ray generating chamber of Kieffer et al. and Tsuno et al., to reduce the number of parts required for laser x-ray generation resulting in simpler alignment of device, and to shorten the distance that the

laser must travel from focusing surface to target, helping to reduce loss of light due to distance traveled through air, as taught by Tsuno et al. above (Paragraph 5, Lines 7-11).

With respect to Claim 3, Kieffer et al., as modified by Tsuno et al. for Claim 1 above, do not teach said coating disposed on an interior surface of said envelope.

Tillman et al. teach a parabolic mirror surface disposed within the interior surface of an envelope of an x-ray generation apparatus, wherein said mirror surface focuses said laser onto target to produce x-rays (Figure 1).

It would be obvious to one of ordinary skill in the art at the time of the invention to use the placement of mirror surface of Tillman et al. in the x-ray generating chamber of Kieffer et al. and Tsuno et al., to shorten the distance that the laser must travel from focusing surface to target, helping to reduce loss of light due to distance traveled through air, as taught by Tsuno et al. above (Paragraph 5, Lines 7-11).

With respect to Claim 4, Kieffer et al. further teach a target made from at least one of the metals molybdenum (Mo), rhodium (Rh), Silver (Ag), and Indium (In) (Page 5, Column 2, Lines 64-66).

With respect to Claim 5, Kieffer et al. further teach a target comprising one of the group of Mo, Rh, Ag, and In, as described in Claim 4 above, each of said elemental metals having an atomic number of at least about 40 (Page 5, Column 2, Lines 64-66).

With respect to Claim 7, Kieffer et al. further teach said x-ray generation chamber comprises a window (34) made of a laser transparent material (Paragraph 50, Lines 7-12).

With respect to Claim 10, Kieffer et al. do not teach said coating comprises at least one of a metal and a dielectric material.

Tsuno et al. teach mirror coating made of metal (Page 7, Column 2, Lines 18-21) or of a multilayer dielectric film (Page 7, Column 2, Lines 22-23).

It would be obvious to one of ordinary skill in the art to use the coating of Tsuno et al. in the apparatus of Kieffer et al., to provide a highly reflective surface for said laser (Paragraph 30).

With respect to Claim 11, Kieffer et al. teach an imaging system (Abstract, Lines 1-2), comprising an x-ray generation chamber (18) with an envelope (See Figure 1), containing a target (16) wherein said target rotates about an axis (Figure 1 and Paragraph 46 Lines 1-3), such that said target is positioned at a focal point of a laser (14, and Paragraph 51 Lines 4-5), exposing a fresh target surface to said laser at each shot of laser onto said target (Paragraph 46, Lines 3-8), a laser source (14) which generates a laser beam (Paragraph 42, Lines 2-4), and a laser targeting system configured to focus said laser beam on a mirror-coated focusing surface (Paragraph 50, Lines 3-6, and Page 6, Column 1, Lines 20-22), and wherein said x-ray generator emits x-rays at locations relative to an imaging volume (Paragraphs 21, and 53-54).

Kieffer et al. do not teach said generation chamber to have at least a partially rounded surface so as to comprise a bulb envelope, or that said bulb envelope has a coating on its curved surface to form a focusing surface for said laser, or that said mirror coating is inside said bulb envelope.

Tsuno et al. teach an optical device in the form of a curved mirror Figure 4(b), Item 102), wherein said curved surface has a thin metal film coating (Page 7, Column 2, Lines 15-21) which forms a mirrored focusing surface (Paragraph 82, Lines 3-5, and Paragraph 83, Lines 4-6) on an underlying curved substrate (Page 7, Column 1, Lines 51-52), said mirror for use with light of shorter wavelengths, including ultra-high frequency ranges (Paragraph 4).

It would be obvious to one of ordinary skill in the art at the time of the invention to use the curved, focusing surface of Tsuno et al. within the x-ray generating chamber of Kieffer et al., to shorten the distance that the laser must travel from focusing surface to target, helping to reduce loss of light due to distance traveled through air, as taught by Tsuno et al. (Paragraph 5, Lines 7-11), and to reduce the number of parts required for laser x-ray generation by removing the need for the parabolic mirror of Kieffer et al.

Tillman et al. teach a parabolic mirror surface disposed within the interior surface of an envelope of an x-ray generation apparatus, wherein said mirror surface focuses said laser onto target to produce x-rays (Figure 1).

It would be obvious to one of ordinary skill in the art at the time of the invention to use the placement of mirror surface of Tillman et al. in the x-ray generating chamber of Kieffer et al. and Tsuno et al., to shorten the distance that the laser must travel from focusing surface to target, helping to reduce loss of light due to distance traveled through air, as taught by Tsuno et al. above (Paragraph 5, Lines 7-11).

With respect to Claim 19, Kieffer et al. further teach one or more image receptor detectors (40) disposed about an imaging volume, said detectors impacted by x-rays from x-ray generation chamber (Paragraph 53, 55, and Claims 23 and 28).

With respect to Claim 22, Kieffer et al. further teach said laser source comprises a chirped-pulse amplified laser (Paragraph 42), which is well known in the art to comprise at least a laser oscillator and a laser amplifier.

With respect to Claim 36, Kieffer et al. further teach the elements of Claim 35 above, but do not teach said generation chamber to have at least a partially rounded surface so as to comprise a bulb envelope, or that said bulb envelope has a coating on its curved surface to form a focusing surface for said laser, or that said mirror coating is inside said bulb envelope.

Tsuno et al. teach an optical device in the form of a curved mirror Figure 4(b), Item 102), wherein said curved surface has a thin metal film coating (Claims 9 and 10) which forms a mirrored focusing surface (Paragraph 82, Lines 3-5, and Paragraph 83, Lines 4-6) on an underlying curved substrate (Page 7, Column 1, Lines 51-52), said mirror for use with light of shorter wavelengths, including ultra-high frequency ranges (Paragraph 4).

It would be obvious to one of ordinary skill in the art at the time of the invention to use the curved, focusing surface of Tsuno et al. within the x-ray generating chamber of Kieffer et al., to shorten the distance that the laser must travel from focusing surface to target, helping to reduce loss of light due to distance traveled through air, as taught by

Tsuno et al. (Paragraph 5, Lines 7-11), and to reduce the number of parts required for laser x-ray generation by removing the need for the parabolic mirror of Kieffer et al.

Tillman et al. teach a parabolic mirror surface disposed within the interior surface of an envelope of an x-ray generation apparatus, wherein said mirror surface focuses said laser onto target to produce x-rays (Figure 1).

It would be obvious to one of ordinary skill in the art at the time of the invention to use the placement of mirror surface of Tillman et al. in the x-ray generating chamber of Kieffer et al. and Tsuno et al., to shorten the distance that the laser must travel from focusing surface to target, helping to reduce loss of light due to distance traveled through air, as taught by Tsuno et al. above (Paragraph 5, Lines 7-11).

Claims 12-18, 23-34, and 38 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kieffer et al., Tsuno et al., and Tillman et al., as disclosed above, and in further view of U.S. Patent to Zhao et al. (USP# 6,937,689).

With respect to Claim 12, Kieffer et al., as modified by Tsuno et al. and Tillman et al., do not teach a motion subsystem configured to move one or more x-ray bulbs along an imaging trajectory.

Zhao et al. teach multiple x-ray generators (141, 142, and 143) configured to move along a computed tomography imaging trajectory (Column 4, Lines 15-20).

It would be obvious to one of ordinary skill in the art at the time of the invention to use the moving, multiple sources of Zhao in the system of Kieffer et al., Tsuno et al., and Tillman et al., to achieve a sampling lattice for computed tomography imaging of a

volume, to reduce motion artifacts and improve signal-to-noise ratio of imaging, as taught by Zhao et al. (Column 3 Lines 41-67, and Column 2 Lines 1-31), and to reduce the number of scans (Column 4, Lines 29-34) which would minimize patient exposure to radiation.

With respect to Claim 23, Kieffer et al., teach a method for irradiating a volume of a breast, said method comprising placing an x-ray generation chamber relative a mammography volume to be imaged (Page 6, Column 1, Lines 47-63, and Page 6, Column 2, Lines 1-29), said x-ray generation chamber comprising an envelope (See Figure 1) containing a target (16) wherein said target rotates about an axis (Figure 1 and Paragraph 46 Lines 1-3), such that said target is positioned at a focal point of a laser (14, and Paragraph 51 Lines 4-5), exposing a fresh target surface to said laser at each shot of laser onto said target (Paragraph 46, Lines 3-8).

Kieffer et al. do not teach said generation chamber to have at least a partially rounded surface so as to comprise a bulb envelope, or that said bulb envelope has a coating on its curved surface to form a focusing surface for said laser, and a plurality of x-ray bulbs positioned at substantially equal intervals about the imaging volume.

Tsuno et al. teach a method of focusing a laser using an optical device in the form of a curved mirror Figure 4(b), Item 102), wherein said curved surface has a thin metal film coating (Page 7, Column 2, Lines 15-21) which forms a mirrored focusing surface (Paragraph 82, Lines 3-5, and Paragraph 83, Lines 4-6) on an underlying curved substrate (Page 7, Column 1, Lines 51-52), said mirror for use with light of shorter wavelengths, including ultra-high frequency ranges (Paragraph 4).

It would be obvious to one of ordinary skill in the art at the time of the invention to use the curved, focusing surface of Tsuno et al. in the x-ray generating chamber of Kieffer et al., and method for its use, to shorten the distance that the laser must travel from focusing surface to target, helping to reduce loss of light due to distance traveled through air, as taught by Tsuno et al. (Paragraph 5, Lines 7-11), and to reduce the number of parts required for laser x-ray generation by removing the need for the parabolic mirror of Kieffer et al.

Tillman et al. teach a parabolic mirror surface disposed within the interior surface of an envelope of an x-ray generation apparatus, wherein said mirror surface focuses said laser onto target to produce x-rays (Figure 1).

It would be obvious to one of ordinary skill in the art at the time of the invention to use the placement of mirror surface of Tillman et al. in the x-ray generating chamber of Kieffer et al. and Tsuno et al., to reduce the number of parts required for laser x-ray generation resulting in simpler alignment of device, and to shorten the distance that the laser must travel from focusing surface to target, helping to reduce loss of light due to distance traveled through air, as taught by Tsuno et al. above (Paragraph 5, Lines 7-11).

Zhao et al. teach a method wherein sources (141, 142, and 143) are moved by a gantry (12) in a CT system (Figures 1 and 2).

It would be obvious to one of ordinary skill in the art at the time of the invention to use the moving, multiple sources of Zhao in the method of Kieffer et al, Tsuno et al., and Tillman et al., to achieve a sampling lattice for computed tomography imaging of a

volume, to reduce motion artifacts and improve signal-to-noise ratio of imaging, as taught by Zhao et al. (Column 3 Lines 41-67, and Column 2 Lines 1-31), and to reduce the number of scans (Column 4, Lines 29-34) which would minimize patient exposure to radiation.

With respect to Claims 13 and 25, Kieffer et al., as modified by Tsuno et al. and Tillman et al., do not teach a motion subsystem configured to move one or more x-ray bulbs along a tomosynthesis imaging trajectory, or the method for its use.

Zhao et al. teach a CT apparatus, and the method for its use, comprising multiple x-ray generators (141, 142, and 143) configured to move along a computed tomography imaging trajectory (Column 4, Lines 15-20), wherein said trajectory is used to perform tomosynthesis (Column 3 Lines 27-32, and Column 4 Lines 21-36).

It would be obvious to one of ordinary skill in the art at the time of the invention to use the moving, multiple sources of Zhao, and the method for their use, in the system and method of Kieffer et al, Tsuno et al., and Tillman et al., to achieve a sampling lattice for computed tomography imaging of a volume, to reduce motion artifacts and improve signal-to-noise ratio of imaging, as taught by Zhao et al. (Column 3 Lines 41-67, and Column 2 Lines 1-31), and to reduce the number of scans (Column 4, Lines 29-34) which would minimize patient exposure to radiation.

With respect to Claims 14 and 24, Kieffer et al., as modified by Tsuno et al. and Tillman et al., do not teach said motion subsystem configured to move one or more x-ray bulbs by moving a CT gantry, and the method for its use.

Zhao et al. teach x-ray sources (141, 142, and 143) moved by a gantry (12) in a CT system (Figures 1 and 2), and the method for its use.

It would be obvious to one of ordinary skill in the art at the time of the invention to use the moving, multiple sources of Zhao, and the method for their use, in the system and method of Kieffer et al, Tsuno et al., and Tillman et al., to achieve a sampling lattice for computed tomography imaging of a volume, to reduce motion artifacts and improve signal-to-noise ratio of imaging, as taught by Zhao et al. (Column 3 Lines 41-67, and Column 2 Lines 1-31), and to reduce the number of scans (Column 4, Lines 29-34) which would minimize patient exposure to radiation.

With respect to Claim 28, Kieffer et al. teach a method for irradiating a volume, said method comprising aiming a laser (14) at an x-ray generation chamber (18) with an envelope (See Figure 1) containing a target (16) wherein said target rotates about an axis (Figure 1 and Paragraph 46 Lines 1-3), such that said target is positioned at a focal point of a laser (14, and Paragraph 51 Lines 4-5), exposing a fresh target surface to said laser at each shot of laser onto said target (Paragraph 46, Lines 3-8), generating an x-ray producing plasma (52, and Paragraph 65) in said chamber by focusing laser onto varying portion of target via mirror, while said laser is aimed at said mirror (32, and Paragraph 50).

Kieffer et al. do not teach said generation chamber to have at least a partially rounded surface so as to comprise a bulb envelope, that said bulb envelope has a coating on its curved surface to form a focusing surface for said laser, a plurality of said

x-ray bulbs differentially positioned relative to an imaging volume, or said bulbs being sequentially illuminated as said laser is aimed sequentially at bulbs.

Tsuno et al. teach an optical device in the form of a curved mirror Figure 4(b), Item 102), wherein said curved surface has a thin metal film coating (Page 7, Column 2, Lines 15-21) which forms a mirrored focusing surface (Paragraph 82, Lines 3-5, and Paragraph 83, Lines 4-6) on an underlying curved substrate (Page 7, Column 1, Lines 51-52), said mirror for use with light of shorter wavelengths, including ultra-high frequency ranges (Paragraph 4).

It would be obvious to one of ordinary skill in the art at the time of the invention to use the curved, focusing surface of Tsuno et al. in the x-ray generating chamber of Kieffer et al., and the method for its use, to shorten the distance that the laser must travel from focusing surface to target, helping to reduce loss of light due to distance traveled through air, as taught by Tsuno et al. (Paragraph 5, Lines 7-11), and to reduce the number of parts required for laser x-ray generation by removing the need for the parabolic mirror of Kieffer et al.

Tillman et al. teach a parabolic mirror surface disposed within the interior surface of an envelope of an x-ray generation apparatus, wherein said mirror surface focuses said laser onto target to produce x-rays (Figure 1).

It would be obvious to one of ordinary skill in the art at the time of the invention to use the placement of mirror surface of Tillman et al. in the method of Kieffer et al. and Tsuno et al., to reduce the number of parts required for laser x-ray generation resulting in simpler alignment of device, and to shorten the distance that the laser must travel

from focusing surface to target, helping to reduce loss of light due to distance traveled through air, as taught by Tsuno et al. above (Paragraph 5, Lines 7-11).

Zhao et al. teach a method comprising using a plurality of x-ray generating sources (141, 142, 143), wherein each source can be individually illuminated using electronic switching, in a time-sequential manner (Column 5 Lines 50-67, and Column 6 Lines 1-11).

It would be obvious to one of ordinary skill in the art at the time of the invention to use the method of Zhao et al. in the method of Kieffer et al., Tsuno et al., and Tillman et al., to achieve better temporal resolution in dynamic CT imaging studies of patients, as taught by Zhao et al. (Column 5, Lines 1-3).

With respect to Claims 15 and 29, Kieffer et al. and Tsuno et al. do not teach imaging a tomosynthesis volume.

Zhao et al. teach a CT apparatus that images a volume using tomosythesis, and the method for its use (Column 3 Lines 27-32, and Column 4 Lines 21-36).

It would be obvious to one of ordinary skill in the art at the time of the invention to use the tomosynthesis of Zhao, and the method for its use, in the system and method of Kieffer et al, Tsuno et al., and Tillman et al., to achieve an image of any tomographic plane from a single tomographic pass, minimizing patient exposure to radiation.

With respect to Claims 16 and 30, Kieffer et al., as modified by Tsuno et al. and Tillman et al. above, do not teach imaging a CT bore volume.

Zhao et al. teach a CT apparatus that images a volume within the bore of said CT apparatus (48).

It would be obvious to one of ordinary skill in the art at the time of the invention to use the CT apparatus of Zhao, and the method for its use, in the system and method of Kieffer et al., Tsuno et al., and Tillman et al., to achieve a CT image, with or without dynamic imaging.

With respect to Claims 17 and 31, Kieffer et al., as modified by Tsuno et al. and Tillman et al., do not teach a plurality of x-ray bulbs positioned generally around at least a portion of the imaging volume, or the method for their use.

Zhao et al. teach x-ray sources (141, 142, and 143) in a CT system (Figures 1 and 2), wherein said sources are positioned around an imaging volume in the form of a patient (22), and the method for their use.

It would be obvious to one of ordinary skill in the art at the time of the invention to use the moving, multiple sources of Zhao, and the method for their use, in the system and method of Kieffer et al., Tsuno et al., and Tillman et al., to achieve a sampling lattice for computed tomography imaging of a volume, to reduce motion artifacts and improve signal-to-noise ratio of imaging, as taught by Zhao et al. (Column 3 Lines 41-67, and Column 2 Lines 1-31), and to reduce the number of scans (Column 4, Lines 29-34) which would minimize patient exposure to radiation.

With respect to Claims 18 and 32, Kieffer et al., as modified by Tsuno et al. and Tillman et al., do not teach a plurality of x-ray bulbs positioned at substantially equal intervals about the imaging volume, or the method for their use.

Zhao et al. teach x-ray sources (141, 142, and 143) in a CT system (Figures 1 and 2), wherein said sources are positioned at substantially equal intervals (Figure 3) around an imaging volume (24), and the method for their use.

It would be obvious to one of ordinary skill in the art at the time of the invention to use the moving, multiple, equidistant sources of Zhao, and the method for their use, in the system and method of Kieffer et al., Tsuno et al., and Tillman et al., to achieve a sampling lattice for computed tomography imaging of a volume, to reduce motion artifacts and improve signal-to-noise ratio of imaging, as taught by Zhao et al. (Column 3 Lines 41-67, and Column 2 Lines 1-31), and to reduce the number of scans (Column 4, Lines 29-34) which would minimize patient exposure to radiation, and to achieve optimal temporal resolution (Column 5 Lines 61-67, and Column 6 Lines 1-11).

With respect to Claim 26, Kieffer et al. further teach one or more image receptor detectors (40) disposed about an imaging volume, said detectors impacted by x-rays from x-ray generation chamber (Paragraph 53 and 55, Page 6, Column 1, Lines 47-63, and Page 7, Column 2, Lines 1-29).

With respect to Claim 27, Kieffer et al. further teach generating one or more projection images based on signals from the one or more detector arrays in response to said x-rays (Paragraphs 53-55).

With respect to Claim 33, Kieffer et al. further teach one or more image receptor detectors (40) disposed about an imaging volume, said detectors impacted by x-rays from x-ray generation chamber (Paragraph 53 and 55, Page 6, Column 1, Lines 47-63, and Page 7, Column 2, Lines 1-29).

With respect to Claim 34, Kieffer et al. further teach one or more projection images produced from signals produced by said detectors in response to detected x-rays (Paragraphs 53-55).

Claims 2 and 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kieffer et al., Tsuno et al., and Tillman et al., as disclosed above, and in further view of U.S. Patent to Ono et al. (USP# 5,696,804).

With respect to Claims 2 and 20, Kieffer et al. as modified by Tsuno et al. and Tillman et al. above in Claims 1 and 11, respectively, do not teach the axis of rotation for said target is geared to rotate based upon the motion of said x-ray bulb about said imaging volume.

Ono et al. teach a CT x-ray imaging system with an x-ray tube device (20) that has a rotating anode target (26), wherein said target rotation is controlled in response to gantry rotation of said tube about the imaging volume (Column 4 Lines 29-35, and Column 6 Lines 52-62) to compensate for the centrifugal force of the gantry, which slows said target rotation (Column 5 Lines 59-67, and Column 6 Lines 1-22).

It would be obvious to one of ordinary skill in the art at the time of the invention to use the target rotation control of Ono et al. in the device and system of Kieffer et al., Tsuno et al., and Tillman et al., to prevent slowing of target rotation during gantry movement, preventing the need for increased power to said target's stator coil and increasing reliability of x-ray apparatus, as taught by Ono et al. (Column 9 Lines 45-67, and Column 10, Lines 1-22).

Claim 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kieffer et al., Tsuno et al., and Tillman et al., as disclosed above, and in further view of U.S. Patent to Hirano et al. (USP# 5,949,849).

With respect to Claim 6, Kieffer et al., as modified by Tsuno et al. and Tillman et al. for Claim 1 above, do not teach said bulb envelope comprises glass.

Hirano et al. teach an x-ray tube (8) having a cylindrically shaped bulb (9) formed of kovar glass (Column 3, Lines 43-44).

It would be obvious to one of ordinary skill in the art at the time of the invention to use the glass bulb of Hirano et al. in the x-ray generating chamber of Kieffer et al., as modified by Tsuno et al. and Tillman et al., kovar glass bulbs being well known in the art for their insulating and vacuum sealant properties and transparent nature.

Claim 8 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kieffer et al., Tsuno et al., and Tillman et al., as disclosed above, and in further view of U.S. Patent to Nelson (USP# 5,982,847), and U.S. Patent to Beeson et al. (USP# 5,696,865).

With respect to Claim 8, Kieffer et al., as modified by Tsuno et al. and Tillman et al. for Claim 1 above, do not teach said bulb envelope comprises a laser transparent polymer.

Nelson teaches an x-ray sample chamber (16) comprised of polymeric material that is transparent to x-rays, as well as an x-ray window composed of polymeric material

that is transparent to x-rays (Column 6 Lines 6-64). Nelson does not teach said polymer is transparent to laser light wavelengths. Examiner notes that the substitution of polymeric material for glass or crystalline material in x-ray tubes, windows, housings, and envelopes is well known in the art, as polymers are more durable, more flexible, and more resistant to x-rays and other wavelengths of light than glass or crystalline materials.

It would be obvious to one of ordinary skill in the art at the time of the invention to use the polymeric material of Nelson in the apparatus of Kieffer et al., as modified by Tsuno et al. and Tillman et al., to provide a more durable and lasting x-ray tube.

Beeson et al. teach an optical window made of polymeric material that is transparent to laser light wavelengths (Column 5 Lines 1-13 and 59-67, and Column 6 Lines 1-20).

It would be obvious to one of ordinary skill in the art at the time of the invention to use the laser transparent polymer of Beeson et al. in the x-ray generating chamber of Kieffer et al., as modified by Tsuno et al. and Tillman et al., to allow passage of the laser source into the x-ray bulb.

Claim 9 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kieffer et al., Tsuno et al., and Tillman et al. as disclosed above, and in further view of U.S. Patent to Kondo et al. (USP# 6,324,255).

With respect to Claim 9, Kieffer et al., as modified by Tsuno et al. and Tillman et al. for Claim 1 above, do not teach at least a partial atmosphere of said bulb is an inert gas.

Kondo et al. teach an x-ray irradiation bulb (Figure 1) wherein the inert gas krypton is pumped into said bulb atmosphere as a target material (Column 14, Lines 3-5).

It would be obvious to one of ordinary skill in the art at the time of the invention to use the inert gas target of Kondo et al. in the x-ray bulb of Kieffer et al., as modified by Tsuno et al. and Tillman et al., to recover and reutilize expensive target material, as taught by Kondo et al. (Column 2, Lines 1-15).

Claim 21 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kieffer et al., Tsuno et al., and Tillman et al., as disclosed above, and in further view of MIT article by Hunter et al.

With respect to Claim 21, Kieffer et al., as modified by Tsuno et al. and Tillman et al. in Claim 11 above, do not teach said laser targeting system comprises a two-axis galvanometer.

Hunter et al. teach a laser beam moved by two galvanometers (Page 4, Paragraph 2).

It would be obvious to one of ordinary skill in the art at the time of the invention to combine the galvanometers of Hunter et al. in the laser targeting system of Kieffer et al., as modified by Tsuno et al. and Tillman et al., to effectively steer said laser beam and

create focal points of varied shapes, said use of two-axis galvanometer being well-known in the art for these purposes.

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

U.S. Patents to: Seppi et al. (USP# 5,335,255), Burke et al. (USP# 5,438,605), Hell et al. (USP# 6,164,820), Hell et al. (USP# 6,181,771), Schoen (USP# 6,333,966), Morken (USP# 6,496,559), and Hell et al. (USP# 6,709,156).

U.S. Patent Application Publication to: Nishimura et al. (PGPUB# 2002/0094063), Mochizuki (PGPUB# 2002/0141537), Kasumi (PGPUB# 2004/0004701), and Wake (PGPUB# 2004/0062352).

Journal articles:

Herbst, L. et al., "High peak power solid state laser for micromachining of hard materials," 7 January 2003, SPIE, Vol. 2, Pp. 4968-14.

Gordon, C.L., et al., "Time-gated imaging with an ultrashort-pulse-laser-produced-plasma x-ray source," 1 May 1995, Optics Letters, Vol. 20, No. 9, Pp. 1056-1058.

Yu, J., et al., "High Magnification Imaging with a Laser-Based Hard X-ray Source," July/August 1999, IEEE Journal of Selected Topics in Quantum Electronics, Vol. 5, No. 4, Pp. 911-914.

Norby, J.R., et al., "Soft x-ray imaging from an ultrashort-pulse laser-produced plasma using a multiplayer coated optic," February 1996, Journal of the optical Society of America B, Vol. 13, No. 2, Pp. 454-458.

Gratz, M., et al., "Time-Gated Imaging in Radiology: Theoretical and Experimental Studies," December 1996, IEEE Journal of Selected Topics in Quantum Electronics, Vol. 2, No. 4, Pp. 1041-1048.

Krol, A., et al., "Micro-CT System For Small Animal Imaging with Ultrafast Laser-Based X-ray Source," 15-18 April 2004, Biomedical Imaging: Macro to Nano, 2004. IEEE International Symposium, Pp. 1516-1519.

Rousse, A., et al., "Efficient K α x-ray source from femtosecond laser-produced plasmas," September 1994, Physical Review E, Vol. 50, No. 3, Pp. 2200-2207.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Anastasia Midkiff whose telephone number is 571-272-5053. The examiner can normally be reached on M-F 7-4.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Edward Glick can be reached on 571-272-2490. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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